

CLAIMS: I claim:

1. A geometrical design arrangement for planet type roller gear. The basic geometrical relationship of the "cyclo-module" to the cyclo housing/roller cage, the cyclo wave disk, and the cam/eccentric dimensions. These geometrical design relations and the realized simplifications are the basic features of these inventions.

2. A geometrical design arrangement for planet type roller gear according to claim 1 wherein: the roller cage has the given relation to the cyclo-module as shown in figure 1.

3. A geometrical design arrangement for planet type roller gears to claim 2: wherein the roller size has a geometrical relation to the cyclo module as indicated under figure 1 .

4. A geometrical design arrangement for planet type roller gears according to claim 3: wherein the eccentric has a geometrical relation to the cyclo module and claim 3.

5. A geometrical design arrangement for planet type roller gear according to claim 4:

wherein the wave disk has a geometrical relation to claim 1 - 4.

6. A geometrical design arrangement for planet type roller gears according to claim 5: wherein three eccentrics are spaced equally between the center and the roller cage as shown in drawings figure 3 and 4.

7. A geometrical design arrangement for planet type roller gears according to claim 6: wherein the number of cams are not limited to 1, 2, or 3, The Size of the cyclo assembly and cost will determine if more than three cams are practical.

8. A geometrical design arrangement for planet type roller gears according to claim 7: wherein the cams are spaced to drive out the high torque generated by the cyclo gears wave disk(s) in connection to the cam(s).

9. A geometrical design arrangement for planet type roller gears according to claim 8: wherein the two drive-out flanges are driven by the cams by play-free bearings (figure 3,4).

10. A geometrical design arrangement for planet type roller gears according to claim 9: wherein flange and housing bearings form a unit axes-cyclo-gear-assembly (Figure 3,4,5).

11. A geometrical design arrangement for planet type roller gears according to claim 10: wherein a multitude of rods (torque, stabilizing bars), hallow or solid, stabilize and rigidities the two drive-out flanges as shown in figures 3,4,5. to a coherent gear-driven axis assembly.

12. A geometrical design arrangement for planet type roller gears according to claim 11: wherein a single or pair of deep groove or a cross-roller bearing is used to stabilize the high torque flange to the gear housing, as in Figure 2, to make the gear assembly an axis or turntable.

13. A geometrical design arrangement for planet type roller gears according to claim 12: wherein all hallow cyclo rollers are securely positioned with pins to the roller cage as shown in figure 1 - 5.

14. A geometrical design arrangement for planet type roller gears according to claim 1 to13: wherein position accuracy by the use of the cyclo gear assembly is further enhanced by controlling its position. To know the rotation position at any

time by adding an absolute shaft encoder to the gear axis drive-in or drive-out, depending on the use of the cyclo gear drive/axis, as shown on figure 6. This is a very important and useful feature and a very worthwhile claim.

15. A geometrical design arrangement for planet type roller gears according to claim 14: wherein the absolute angular encoder, consisting of a permanently battery power backed "On" encoder up/down counter with accessible shift register / memory is added as shown in Figure 5.

16. A geometrical design arrangement for planet type roller gears according to claim 15: wherein the analog summing circuits and feed-back servo circuit often feeds back data misdirecting the summing results and therefor the servo action. The figure 7 frequency and servo filter counteracts irrelevant signals and enhances further the productivity and performance of the cyclo torque multiplier and cyclo gear axis.

\*\*\*\*\*

10/04/2626

## CYCLO TORQUE MULTIPLIERS

**Abstract:** Geometric design arrangements and relations of cyclo gears fashioned to produce high mechanical rigidity, long life expectancy, and applicability. These designs incorporate bearing and hub-axis, hollow centers and hollow torque pins, especially with three disks and three cam cyclo gear arrangements. The previous performance limiting load vector influence is eliminated. These inventions simplify the building of machines, particularly when multiple cyclo gear axes are used in sequence, as in base turn tables and arm and wrist assembly clusters for robots and other tools. A true roll-up by maximum engagement of the cyclo components is guaranteed by employing the geometrical relations shown. Also included are 1) a schematic showing simplification of the absolute encoder system for servos in machine tools and robotics and 2) a circuit for an anti-oscillating add-on filter for servos in machine tools and robotics. Time spacing update limitations of many controls and the form plasticities of materials are being minimized and masked with these patent features.